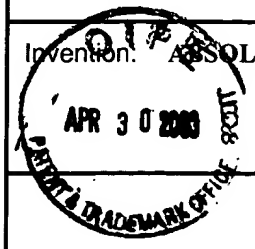
05-01-03 28PH 283

AMENDMENT TRANSMITTAL LETTER (Small Entity) Applicant(s): Yoshinori ITO			Docket No. 04452/015001
Serial No. 09/912,938	Filing Date July 25, 2001	Examiner P. CUEVAS	Group Art Unit 2834

Invention: ABSOLUTE POSITION DETECTING DEVICE FOR A LINEAR ACTUATOR



TO THE ASSISTANT COMMISSIONER FOR PATENTS:

Transmitted herewith is an amendment in the above-identified application.

- ☒ Small Entity status of this application has been established under 37 CFR 1.27 by a verified statement previously submitted.
- ☐ A verified statement to establish Small Entity status under 37 FR 1.27 is enclosed.

The fee has been calculated and is transmitted as shown below.

CLAIMS AS AMENDED

	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST # PREV. PAID FOR		NUMBER EXTRA CLAIMS PRESENT		RATE	ADDITIONAL FEE
TOTAL CLAIMS	2	-	20	=	0	x	$9.00	$0.00
INDEP. CLAIMS	1	-	3	=	0	x	$42.00	$0.00
Multiple Dependent Claims (check if applicable) ☐								$0.00
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT								$0.00

- ☒ No additional fee is required for amendment.
- ☐ Please charge Deposit Account No. in the amount of
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  - ☒ Any additional filing fees required under 37 C.F.R. 1.16.
  - ☒ Any patent application processing fees under 37 CFR 1.17.

#45,079
Signature

Dated: 4/30/03

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CERTIFICATE OF MAILING BY "EXPRESS MAIL" (37 CFR 1.10) Applicant(s): Yoshinori ITO			Docket No. 04452/015001
Serial No. 09/912,938	Filing Date July 25, 2001	Examiner P. CUEVAS	Group Art Unit 2834

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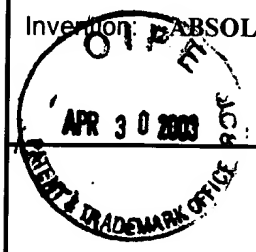

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant :	Yoshinori ITO	Art Unit :	2834
Serial No.:	09/912,938	Examiner :	Cuevas, P.
Filed :	July 25, 2001		
Title :	ABSOLUTE POSITION DETECTING DEVICE FOR A LINEAR ACTUATOR		

Assistant Commissioner for Patents
Washington, DC 20231

REPLY UNDER 37 CFR § 1.111

In response to the Office Action dated February 5, 2003, please consider the included remarks. Applicant thanks the Examiner for carefully considering this application.

I. Disposition of Claims

Claims 1 and 2 are pending in this application. Claim 1 is independent and claim 2 depends from claim 1.

II. Rejection under 35 U.S.C § 103

Claims 1 and 2 were rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,557,154 ("Erhart") in view of U.S. Patent No. 5,731,702 ("Schroeder"). This rejection is respectfully traversed.

The combination of Erhart and Schroeder does not disclose, "an absolute position detecting device for a linear actuator having a motor, an output shaft, and a conversion means for converting output rotation of the motor to linear motion of the output shaft, comprising: a rotary absolute sensor that detects an absolute rotary position per rotation of the motor; a linear absolute sensor that detects an absolute linear position within a set

range of movement of the output shaft; and, calculation means for calculating an absolute linear position of the output shaft based on a combination of an output of the rotary absolute sensor and an output of the linear absolute sensor; wherein the range of movement of the output shaft over which the absolute linear position can be detected by the linear absolute sensor is different from a distance by which the output shaft is moved per rotation of the motor as converted by the conversion means," as recited by claim 1.

Erhart is completely silent to a linear actuator having both a linear absolute sensor and a rotary sensor, in addition to, a calculation means, as required by claim 1.

First, the sensor (510 shown in Figure 9 and 10) is a rotary sensor. Please see label for reference numeral 510, which states "Rotational Position Sensor." Regarding sensor (510), Erhart states, "the angular position control of the rotary sensor 510 [which] is provided to the controller 506," (col. 8, ll. 18 and 19). Angular position is a function of rotation, rather than an axial (or linear) displacement. In other words, the detection pitch of the linear absolute sensor is different from a stroke of the motor output shaft per rotation. Thus, the sensor (510) is *not* "a linear absolute sensor that detects an absolute linear position within a set range of movement of the output shaft," as recited in claim 1. In contrast, the sensor (510) is a rotary sensor as explicitly stated by Erhart.

Additionally, claim 1 explicitly recites, "the range of movement of the output shaft over which the absolute linear position can be detected by linear absolute sensor is different from a distance by which the output shaft is moved per rotation of the motor as converted by the conversion means." Thus, the sensor as taught by Erhart, being a rotary sensor, does *not* provide a range of movement of the output shaft different from a distance by which the output shaft is moved per rotation.

Furthermore, Erhart teaches away from the use of a linear absolute sensor. For example, Erhart states:

> In order to utilize closed-loop control, the controller 506 must receive information as to the velocity and the position of the actuator's 400 output shaft 25 at all times. A previous method of deriving this information was to utilize *a linear position sensor*. Such sensors exist in many forms and include potentiometers, LVDTs or magnostrictive types. While the accuracy of the feedback sensor may vary without affecting control, the velocity feedback must be continuous and linear with respect to the voltage applied in order for the system to operate correctly. Likewise, the relationship between the armature's movement and the sensed position must be continuous and linear for closed-loop to operate correctly. However, in any screw style rotary-to-linear conversion mechanism a small amount of backlash exists, introducing error in these systems. (col. 6, l.55- col. 7, l.2)

In other words, Erhart teaches that a linear position sensor introduces error in controller (506). In response to this issue, Erhart states, "the preferred solution is to measure its rotational position and velocity and allow the motion controller 506 to calculate the resulting position of the actuator's 400 output shaft 25," (col. 7, ll. 41-44), *i.e.*, the preferred solution is to use a rotary sensor. Therefore, Erhart expressly teaches away from the use of a linear absolute sensor. Consequently, Erhart expressly teaches away from the use of both a rotary sensor *and* a linear absolute sensor, as required by claim 1.

Furthermore, because Erhart teaches away from the use a linear absolute sensor and a rotary sensor, Erhart cannot teach "a calculation means for calculating an absolute linear position of the output shaft based on a combination of an output of a rotary absolute sensor and an output of a linear absolute sensor," as recited by claim 1.

Erhart simply teaches a controller (506), which attempts to eliminate the gap between the target and actual values. In particular, the controller receives a signal, which includes an output signal generated from the desired position of the output shaft

compared to the position of the output shaft determined by rotational position sensor (510). (Please see, *e.g.*, col. 9, ll. 25-30.) The controller (506) operates in response to output generated by the rotary sensor, which is in contrast to the claimed invention, which operates based on outputs generated by a linear absolute sensor and a rotary absolute sensor. Therefore, Erhart does not teach a calculation means, which receives input based on a linear sensor and a rotary sensor

Finally, Schroeder fails to provide that which Erhart lacks. Schroeder relates to a rotary sensor with a time-based back up sensor. Schroeder does not teach the use of a linear absolute sensor in conjunction with a rotary sensor, nor a calculation means, as recited by claim 1.

Because Erhart and Schroeder, whether considered separately or in combination, fail to disclose or suggest the recited invention, claim 1 is patentable over Erhart and Schroeder. Claim 2, which depends from claim 1, is likewise patentable for at least the same reasons. Accordingly, withdrawal of this rejection is respectfully requested.

III. Concluding Remarks

Applicant believes this reply to be fully responsive to all outstanding issues and place this application in condition for allowance. If this belief is incorrect, or other issues arise, do not hesitate to contact the undersigned or his associates at the telephone number listed below. Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference Number 04452.015001).

Respectfully submitted,

Date: 4/30/03

#45,079

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